

Claims

1. A barrier movement operator comprising:

5 an A.C. motor having a rotatable rotor connected
to a barrier for movement thereof;

sensing apparatus to generate motor signals
representing an operational variable of the motor;

10 controller for controlling movement of the barrier
by controlling the energization of the motor and being
responsive to changes in the sensed operational variable
represented by the motor signals for changing the
15 energization of the motor wherein;

the motor is constructed to exhibit an enhanced
operating characteristic of sensed operational variable
to torque to improve the rapid detection by the
20 controller of changes in a rate movement of the barrier
by detecting changes in the operational variable.

2. A barrier movement operator in accordance with
claim 1 wherein the motor is an induction A.C. motor and
25 the enhanced operating characteristic is achieved by
controlling a conduction resistance of inductance
powered rotor conductors.

3. A barrier movement operator in accordance with
30 claim 1 wherein the sensed operational variable is the
rate of rotation of the rotor of the motor.

4. A barrier movement operator according to claim
3 wherein the motor exhibits a no load rotation rate in
the range of 1000 to 2000 revolutions per minute and an
operating characteristic in which a change in torque
5 output of the motor of approximately 1 ft.lb. results in
a change in the rotation rate of the range of 30 to 120
revolutions per minute.

5. A barrier movement operator in accordance with
10 claim 1 wherein the sensed operational variable is
driving current to the motor.

6. A barrier movement operator comprising:

15 an A.C. motor having a rotatable rotor connected
to a barrier for movement thereof;

sensing apparatus to generate motor signals
representing an operational variable of the motor;

20 the movement of the barrier being controlled by a
controller which responds to the motor signals by
selectively stopping rotation of the rotor or reversing
the rotation of the rotor; and

25 a power control arrangement for providing
energizing power to the motor to improve the rapid
response by the controller to changes in a rate of
movement of the barrier as reflected in changes of the
30 sensed operational variable.

7. A barrier movement operator according to claim 4 wherein the power control arrangement receives A.C. power input substantially in the form of a sine wave and 5 conducts portions of successive cycles of the sine wave of the received A.C. power to the motor to enhance the sensed operational variable to torque characteristic of the motor.

10 8. The barrier movement operator according to claim 7 wherein the A.C. power comprises successive positive and negative cycles of current and the power control arrangement conducts a portion, but less than all of each cycle of current to the motor.

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9. The barrier movement operator of claim 6 wherein the sensed operational variable is the rate of rotation of the rotor of the motor.

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10. The barrier movement operator of claim 6 wherein the sensed operational variable is a driving current to the motor.

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11. A barrier movement operator comprising:

a motor comprising a rotatable rotor coupled to a barrier for movement thereof between open and closed positions;

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position detecting apparatus generating position signals representing a position of the barrier during movement of the barrier;

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motor speed detecting apparatus to generate motor signals representing a sensed operational variable of the motor;

a controller responsive to the position signals and the motor signals for controlling the motor to reverse a direction of movement of the barrier during a first range of sensed positions when the sensed
5 operational variable speed of the motor is less than a first amount determined by subtracting a first parameter from an expected motor speed and for reversing the rotation direction of the motor during a second range of sensed positions when the sensed operational variable of
10 the motor is less than a second amount determined by subtracting a second parameter from an expected motor speed; and

the second parameter is greater than the first
15 parameter.

12. A barrier movement operator according to claim
11 where the barrier is moved between an open position and a closed position and the second range of sensed
20 positions occurs when the barrier is near the closed position.

13. The barrier movement operator according to claim 11 wherein the second range of sensed positions
25 occurs within 18 inches of the closed position.